Alternatives in semantics

EGG, Wrocław, 29 July 2019

1 Alternatives in semantics and pragmatics

- This course: the role of alternatives in the semantics of indefinites, questions, and (to a lesser extent) focus.

- Alternatives: roughly, things a speaker might have said, but didn't.

- Simple example: from *I only drink PERRIER*, you infer that I don't drink any of the salient alternatives to Perrier. From *I only DRINK Perrier*, you infer that I don't do any of the salient alternatives to drinking with Perrier (say, bathing with it).

- Empirical phenomena where alternatives have been argued to be relevant:

  - Indefinites, indeterminates, FCIs, and disjunction (broadly, "indefinite-ness"). The *sine qua non* of indefiniteness is the invocation of alternative possibilities.

  - Questions: interrogatives denote sets of alternative propositions from which answers are drawn.

  - Focus: see above. Focused expressions invoke alternatives, which interact with focus-sensitive expressions (e.g. certain adverbs).

  - Implicature: utterances generally trigger inferences that logically stronger relevant alternatives are unassertable.

  - Transderivational economy: the grammar makes reference to alternative utterances.

- Several ways for alternatives to matter for linguistics:

  - Alternatives feature in our pragmatic lives, but have no role to play in the semantics proper *à la* (neo-)Grice.

  - Alternatives get generated in the semantics, and are accordingly dealt with semantically. But the necessary adjustments are confined to the lexicon. Nothing about the grammar's basic workings needs to change (cf. Karttunen 1977).

  - Alternatives are generated in the semantics, and are reckoned with *grammatically*. That is, the grammar's the sort of thing that manipulates alternatives. This is where we'll focus our energies.

2 Basics

2.1 A toy alternative semantics for indefinites

- Three parts: lexical entries lifted into sets, new semantics for functional application, non-singleton-set semantics for certain items.

- Normal semantics, assuming the functor is on the left and ignoring index-sensitivity (Heim & Kratzer 1998):

$$[\![X\ Y]\!] = [\![X]\!]([\![Y]\!])$$

- Lifting into an alternative semantics, in the standard way (Hamblin 1973; Rooth 1985, 1992). Meanings of type α systematically replaced with meanings of type $\alpha \to t$, and a new semantics for binary composition:

$$[\![X\ Y]\!] = \{x(y) : x \in [\![X]\!] \wedge y \in [\![Y]\!]\}$$

- Trivial example:

$$[\![\text{Bill left}]\!] = \{f(x) : x \in \{\mathsf{b}\} \wedge f \in \{\mathsf{left}\}\}$$
$$= \{\mathsf{left(b)}\}$$

- Alternative generators: constituents that denote non-singleton sets.

$$[\![\text{a linguist}]\!] = \{x : \mathsf{ling}(x)\}$$
$$= \mathsf{ling}$$

- Exploiting this meaning, here's a less trivial example:

$$[\![\text{a linguist left}]\!] = \{f(x) : x \in \mathsf{ling} \wedge f \in \{\mathsf{left}\}\}$$
$$= \{\mathsf{left}(x) : \mathsf{ling}(x)\}$$

- Predicate modification can be lifted in a similar way:

$$[\![X\ Y]\!] = \{x \cap y : x \in [\![X]\!] \wedge y \in [\![Y]\!]\}$$

- More generally, for two-place function f, a *point-wise* version f' can be defined, as follows (i.e. previously we instantiated f as functional application):

$$f'(X)(Y) := \{f(x)(y) : x \in X \land y \in Y\}$$

- Predicate abstraction? We don't mention assignment functions in the previous versions (for simplicity). Is there a simple abstraction rule, along the lines of application/modification? Turns out, the answer is negative (Rooth 1985; Shan 2004; Romero & Novel 2013; Charlow 2014).

- In a sense, this isn't so surprising. Abstraction is non-compositional in Heim & Kratzer 1998, and so the binary-compositional strategy shouldn't be expected to work. Still, it comes as a bit of a shock that there is *no* rule of predicate abstraction consistent with standard treatments of binding.

- Taming alternatives: syncategorematic closure operators. Because alternative expansion is just baked into how the grammar works as a default, rules that tame alternatives will need to be specified syncategorematically, i.e. in terms of the grammar per se.

$$\llbracket \exists\ S \rrbracket := \{\exists p.\, p \in \llbracket S \rrbracket \land p\}$$

- Example:
$$\llbracket \exists\ [\text{a linguist left}] \rrbracket = \{\exists x.\, \text{ling}(x) \land \text{left}(x)\}$$

- More on syncategorematicity: try to specify the semantics of *some* independently of its NP. Actually cannot be done! Of course, there are ways around this, though they require complicating the syntax and/or semantics (see e.g. Rooth & Dong 2011).

2.2 Other sources of alternatives

- Questions: standard line is that the meaning of a question Q is the set of possible answers to Q (with "possible answer" construed differently in different theories), associated one way or another with some speech-act-y force that instructs the addressee to choose an *answer* from among the set of alternatives (Hamblin 1958, 1973; Karttunen 1977; a.o.):

$$\llbracket \text{who left} \rrbracket = \lambda p.\, \exists x.\, \text{human}(x) \land p = \text{left}(x)$$
$$= \{\text{left}(x) : \text{human}(x)\}$$

- Alternative semantics gives a natural way to derive these sets. Suppose *who* is an alternative-generator:

$$\llbracket \text{who} \rrbracket = \{x : \text{human}(x)\}$$

- Therefore:
$$\llbracket \text{who left} \rrbracket = \{\text{left}(x) : \text{human}(x)\}$$

- (Strictly speaking these meanings aren't correct: they ignore index-sensitivity—in particular, sensitivity to a world or circumstance of evaluation; that is, *which* humans are we talking about? But they're here to whet our intuitions for what's to come.)

- Operators that manipulate/discharge alternatives (weakly exhaustive):

$$\llbracket \text{knows Q} \rrbracket := \{\lambda x.\, \lambda w.\, \forall p \in \llbracket Q \rrbracket.\, p(w) \Rightarrow \text{Bel}_w(x, p)\}$$

- Focus: e.g. *I only drink PERRIER*. The semantics of the focus-sensitive adverb *only* interacts with the alternatives triggered by the focused *PERRIER*.

- Alternative semantics for focus: meanings are *bidimensional*. Expressions are associated with a normal value, and a focus value. Standard way this is implemented, following Rooth 1985, 1992, is with a pair of interpretation functions, $\llbracket \cdot \rrbracket$ and $\llbracket \cdot \rrbracket_f$. The former of these works like Heim & Kratzer 1998. The latter is alternative-friendly functional application.

$$\llbracket \text{JOHN}_\text{F} \rrbracket = \{x \mid x \in \text{Alt}\,\llbracket \text{John} \rrbracket\}$$

- Only (again, stated syncategorematically!):

$$\llbracket \text{only VP} \rrbracket := \lambda x.\, \lambda w.\, \{P : P \in \llbracket \text{VP} \rrbracket_f \land P(x)(w)\} = \{\llbracket \text{VP} \rrbracket\}$$

- So, coupled with the semantics for focused expressions, *only* has the effect of indirectly quantifying over the focused element(s) in its sister.

3 Consequences

3.1 Islands

- Alternatives expand up to the point where they meet an alternative-squashing operator. Thus, alternative semantics is a sort of *pseudo-scope* mechanism,

i.e. one where the semantic effects of alternative generators can be felt at positions far above their scope position at LF.

$$[\![\text{every philosopher met a linguist}]\!] = \{\forall x.\,\text{phil}(x) \Rightarrow \text{met}(x, y) : \text{ling}(y)\}$$

- Applying $\exists$-closure to this alternative set gives a set whose single member is the familiar inverse-scope truth condition that we associate with *every philosopher met a linguist*.

- Happily, island-insensitivity seems to be a hallmark of the things we've cast in terms of alternative semantics:

- Indefinites: If ⟨a relative of mine dies⟩, I'll inherit a house. (Disjunction: Rooth & Partee 1982)

- Questions (e.g. Huang 1982; Nishigauchi 1990; Dayal 1996; Reinhart 1997; Shimoyama 2006):

(1) a. Which ling will be offended if ⟨we invite which phil⟩?
  b. Who knows ⟨who read what⟩?
  c. Japanese: Taro-wa ⟨**dare**-ga kita-kara⟩ kaerimasita ka?
   (Lit. 'Taro left because who came?')
  d. Chinese: Ni xihuan ⟨**shei** xie de⟩ shu?
   (Lit. 'you like the book that who wrote?')

- Focus: I'll only go if ⟨JOHN_F goes⟩.

3.2 Unselectivity (and its discontents)

- Two indefinites:

$$[\![\text{a philosopher met a linguist}]\!] = \{\text{met}(x, y) : \text{phil}(x) \wedge \text{ling}(y)\}$$

- Closure obligatorily forecloses both sources of alternatives:

$$\{\exists x.\,\exists y.\,\text{phil}(x) \wedge \text{ling}(y) \wedge \text{met}(x, y)\}$$

- That is, the following selective closures are both un-obtainable:

$$\{\exists x.\,\text{phil}(x) \wedge \text{met}(x, y) : \text{ling}(y)\}$$
$$\{\exists y.\,\text{ling}(y) \wedge \text{met}(x, y) : \text{phil}(x)\}$$

- Alternative semantics for questions works similarly:

$$[\![\text{who read what}]\!] = \{\text{read}(x, y) : \text{human}(x) \wedge \text{thing}(y)\}$$

- ...As does focus. E.g. for *I only introduced BILL to SUE*, alternative semantics readily derives the reading that quantifies over pairs of introducees:

$$[\![\text{introduced BILL}_\text{F} \text{ to SUE}_\text{F}]\!] = \{\lambda x.\,\text{intro}(x, y, z) : y \in [\![\text{BILL}_\text{F}]\!]_f \wedge z \in [\![\text{SUE}_\text{F}]\!]_f\}$$

- Is unselectivity desirable? Dissociable from island-insensitivity, if not? Some cases to consider:

(2) a. If ⟨a lawyer visits a relative of mine⟩, I'll inherit a house.
  b. Who knows ⟨who read what⟩?
  c. A: John only introduced me to SUE_F.
   B: He also only [introduced ME_F to SUE_F].

- Eep! These cases are uniformly problematic for alternative semantics. How, in any case, could one alternative generator scope out of the island, and the other not?

- And keep in mind: alternative semantics lacks a workable treatment of binding. Can we get all the good and none of the bad, or is it a package deal?

4 Scopal treatments

- Scopal semantics for indefinites:

$$[\![\text{a linguist}]\!] = \lambda P.\,\exists x.\,\text{ling}(x) \wedge P(x)$$

- LF for *every philosopher met a linguist*:

$$[\![[[\text{a linguist}]\ [1\ [\text{every philosopher}]\ \text{met}\ t_1]]]\!]$$
$$= \exists y.\,\text{ling}(y) \wedge \forall x.\,\text{phil}(x) \Rightarrow \text{met}(x, y)$$

- Scopal treatment of (association with) focus (cf. Krifka 1991, 2006):

$$[\![\text{only}]\!] = \lambda P.\,\lambda x.\,\{y : P(y)\} = \{x\}$$

- LF for *Mary only met JOHN*:

$$[\![\text{JOHN}_\text{F} \,[\text{only } [1 \text{ Mary met } t_1]]]\!]$$

- Scopal semantics for questions (cf. Karttunen 1977; Dayal 1996; Heim 2000):

$$[\![\text{who}]\!] = [\![\text{someone}]\!] = \lambda P.\,\exists x.\,\text{human}(x) \wedge P(x)$$

- Proto-question formation (cf. Partee 1986's IDENT-shifter)

$$[\![C_\circ]\!] := \lambda p.\,\{p\} = \lambda p.\,\lambda q.\,p = q$$

- Gives the following LF:

$$[\![1\,[\text{who } [2\,[C_\circ\ t_1]\,[t_2 \text{ left}]]]]\!] = \lambda p.\,[\![\text{who}]\!]\,(\lambda x.\,p = \text{left}(x))$$
$$= \lambda p.\,\exists x.\,\text{human}(x) \wedge p = \text{left}(x)$$

- On any of these approaches, where an expression's "alternatives" are "felt" corresponds to that expression's scope position.

- Something we'll focus on: are there arguments, empirical or "conceptual", for scopal treatments over non-scopal treatments (or vice versa)? What trade-offs present themselves? At a finer level of grain, might the answers to these questions cut different ways depending on the phenomenon under consideration?

5 Dynamic semantics as alternative semantics?

5.1 Basics of dynamic semantics

- The binding behavior of indefinites resembles proper names more than quantifiers. They bind across sentences, out of relative clauses, etc.

(3)   A linguist$_i$ left. She$_i$ was tired.

- Two approaches in the dynamics literature. One involves bona fide existential quantification, imbues indefinites with a special ability to extend their binding scope (e.g. Groenendijk & Stokhof 1990; Zimmermann 1991; Dekker 1993; Szabolcsi 2003; de Groote 2006):

$$[\![\text{a linguist left}]\!] = \lambda \kappa.\,\exists x.\,\text{ling}(x) \wedge \text{left}(x) \wedge \kappa(x)$$

- The second: discourse referents (Karttunen 1976). Processing a sentence with a proper name transitions you into a state with a discourse referent for John. E.g., assuming John left:

$$[\![\text{John left}]\!] = \lambda s.\,\{s + \text{j}\}$$

(As for '$s + x$', it doesn't matter what it is. Think of it as an arbitrary way to make x available qua dref in the state s.)

- How to fold in indefinites? What does it mean for an indefinite to make a discourse referent?

- The standard solution relies on *nondeterminism* (e.g. Heim 1982; Barwise 1987; Groenendijk & Stokhof 1991; Dekker 1994; Muskens 1996; Brasoveanu 2007).

$$[\![\text{a man left}]\!] = \lambda s.\,\bigcup_{x \in \text{man}} [\![\text{left}]\!](x)(s + x)$$
$$= \lambda s.\,\{s + x : \text{man}(x) \wedge \text{left}(x)\}$$

- Where...

$$[\![\text{left}]\!] = \lambda x.\,\lambda s.\,\begin{cases} \{s\} \text{ if } x \text{ left} \\ \{\ \} \text{ otherwise} \end{cases}$$

- The idea: indefinites are like multiply-realized versions of proper names.

5.2 Comparison

- This looks a little unfamiliar, but consider the following equivalent alternative-semantic representations for *a linguist left*:

$$\bigcup_{x \in \text{ling}}(\lambda y.\,\{\text{left } y\})(x) = \bigcup_{x \in \text{ling}}\{\text{left}(x)\} = \{\text{left}(x) : \text{ling}(x)\}$$

- A major goal of this seminar will be exploring the relationship between quantificational and non-quantificational treatments of indefiniteness, and between dynamic and static approaches to their semantics.

- E.g. what do dynamic and alternative perspectives have in common? What is different? How much of that is necessarily so? Parameters to investigate:

  – How composition happens.

- Closure: how alternatives are tamed.

- Interactions with islands.

- (Un)selectivity.

- While it has at times been recognized that these approaches have some similarity (e.g. Kratzer 2005 emphasizes that both dynamic and alternative semantics give non-quantificational treatments of indefinites), anecdotally, I can report that people tend to think they have nothing to do with each other! I tend to disagree. We will get there..

- A final point: Reinhart 1997 is famous in part because of its evocative arguments (*ad Donald Duckum*) that dynamically oriented accounts of exceptional scope are fundamentally flawed. It will be worth reconsidering these objections as we go along.

6   Connections

- Empirical:

  - Much work suggests that *wh* words are inherently focused (e.g. Rooth & Dong 2011).

  - Many languages use the same morphemes to build questions, indefinites, disjunctions, polarity items, etc.

- Rooth 1996 on desirability of and prospects for theoretical unification:

  > [T]he island-sensitivity of scope-bearing operators is quite diverse. Similar insensitivity to scope islands can be observed for indefinites, and for in situ *wh*.... The group of island-escaping operators does not appear to be an arbitrary one. As mentioned [earlier], there is a connection between the semantics of focus and the semantics of questions. Several existing theories of wh semantics (e.g. Karttunen 1977) make a different connection with indefinites, in that *wh* phrases themselves (as opposed to the question clauses they are embedded in) are given an existential semantics. This semantic similarity, together with the common insensitivity to scope islands, suggest that we should not be satisfied with a theory which treats focus as sui generis. We would like to replace the focus-specific definition with a theory in which focus is one of a family of island-insensitive operators which,

roughly, use restricted variables to name families of propositions, open propositions, and/or their existential closures. It is not at all clear to me how this should be done.

- BE-shifter (Partee 1986): a way to move between indefinite GQs (e.g. *a linguist*) and the corresponding set of "witnesses" (e.g. the set of linguists)

$$\textsc{be} := \lambda \mathcal{P}.\, \lambda x.\, \mathcal{P}\, (\lambda y.\, y = x)$$

- A-shifter: a way to move between sets and the corresponding indefinite GQ:

$$\textsc{a} := \lambda P.\, \lambda Q.\, \exists x.\, P(x) \wedge Q(x)$$

- (Partial) inverses of each other:

  - In general, $\textsc{be}(\textsc{a}(P)) = P$.

  - For existentially quantified GQs $\mathcal{P}$, $\textsc{a}(\textsc{be}(\mathcal{P})) = \mathcal{P}$.

- Existential GQs and sets are formally closely related. The two treatments are not, therefore, so different in kind. Given independently motivated (indeed, Partee conjectures, universal) type-shifters, one can be derived from the other.

- This fundamental connection underlies, at least implicitly, much research in semantics. So, an important question we will try to tease out: is there *any* grounds for (dis-)preferring an alternative semantics in certain cases?

- How are different sorts of alternatives supposed to interact in languages where they do and stay separate in languages where they don't? What differentiates languages where a single word leads a double life, i.e. as an indefinite and a question morpheme?

References

Barwise, Jon. 1987. Noun phrases, generalized quantifiers, and anaphora. In Peter Gärdenfors (ed.), *Generalized Quantifiers*, 1–29. Dordrecht: Reidel. doi:10.1007/978-94-009-3381-1_1.

Brasoveanu, Adrian. 2007. *Structured nominal and modal reference*: Rutgers University Ph.D. thesis. http://semanticsarchive.net/Archive/TFjZGZjN/.

Charlow, Simon. 2014. *On the semantics of exceptional scope*: New York University Ph.D. thesis. http://semanticsarchive.net/Archive/2JmMWRjY/.

Dayal, Veneeta. 1996. *Locality in wh quantification*. Dordrecht: Springer Science+Business Media. doi:10.1007/978-94-011-4808-5.

Dekker, Paul. 1993. *Transsentential meditations: ups and downs in dynamic semantics*: University of Amsterdam Ph.D. thesis. http://hdl.handle.net/11245/1.392554.

Dekker, Paul. 1994. Predicate logic with anaphora. In Mandy Harvey & Lynn Santelmann (eds.), *Proceedings of Semantics and Linguistic Theory 4*, 79–95. Ithaca, NY: Cornell University. doi:10.3765/salt.v4i0.2459.

Groenendijk, Jeroen & Martin Stokhof. 1990. Dynamic Montague grammar. In Laszlo Kalman & Laszlo Polos (eds.), *Proceedings of the Second Symposium on Logic and Language*, 3–48. Budapest: Eötvös Loránd University Press.

Groenendijk, Jeroen & Martin Stokhof. 1991. Dynamic predicate logic. *Linguistics and Philosophy* 14(1). 39–100. doi:10.1007/BF00628304.

de Groote, Philippe. 2006. Towards a Montagovian account of dynamics. In Masayuki Gibson & Jonathan Howell (eds.), *Proceedings of Semantics and Linguistic Theory 16*, 1–16. Ithaca, NY: Cornell University. doi:10.3765/salt.v16i0.2952.

Hamblin, C. L. 1958. Questions. *Australasian Journal of Philosophy* 36(3). 159–168. doi:10.1080/00048405885200211.

Hamblin, C. L. 1973. Questions in Montague English. *Foundations of Language* 10(1). 41–53.

Heim, Irene. 1982. *The semantics of definite and indefinite noun phrases*: University of Massachusetts, Amherst Ph.D. thesis. http://semanticsarchive.net/Archive/Tk0ZmYyY/.

Heim, Irene. 2000. Notes on interrogative semantics. Unpublished lecture notes.

Heim, Irene & Angelika Kratzer. 1998. *Semantics in generative grammar*. Oxford: Blackwell.

Huang, C.-T. James. 1982. *Logical relations in Chinese and the theory of grammar*: Massachusetts Institute of Technology Ph.D. thesis.

Karttunen, Lauri. 1976. Discourse referents. In James D. McCawley (ed.), *Syntax and Semantics, volume 7: Notes from the Linguistic Underground*, 363–385. New York: Academic Press.

Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1(1). 3–44. doi:10.1007/BF00351935.

Kratzer, Angelika. 2005. Indefinites and the operators they depend on: From Japanese to Salish. In Gregory N. Carlson & Francis Jeffry Pelletier (eds.), *Reference and quantification: The Partee effect*, 113–142. Stanford: CSLI Publications.

Krifka, Manfred. 1991. A compositional semantics for multiple focus constructions. In Steve Moore & Adam Wyner (eds.), *Proceedings of Semantics and Linguistic Theory 1*, 127–158. Ithaca, NY: Cornell University. doi:10.3765/salt.v1i0.2492.

Krifka, Manfred. 2006. Association with focus phrases. In Valéria Molnár & Susanne Winkler (eds.), *The Architecture of Focus*, 105–136. Mouton de Gruyter.

Muskens, Reinhard. 1996. Combining Montague semantics and discourse representation. *Linguistics and Philosophy* 19(2). 143–186. doi:10.1007/BF00635836.

Nishigauchi, Taisuke. 1990. *Quantification in the theory of grammar*. Dordrecht: Kluwer Academic Publishers. doi:10.1007/978-94-009-1972-3.

Partee, Barbara H. 1986. Noun phrase interpretation and type-shifting principles. In Jeroen Groenendijk, Dick de Jongh & Martin Stokhof (eds.), *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*, 115–143. Dordrecht: Foris.

Reinhart, Tanya. 1997. Quantifier scope: How labor is divided between QR and choice functions. *Linguistics and Philosophy* 20(4). 335–397. doi:10.1023/A:1005349801431.

Romero, Maribel & Marc Novel. 2013. Variable binding and sets of alternatives. In Anamaria Fălăuş (ed.), *Alternatives in Semantics*, chap. 7, 174–208. London: Palgrave Macmillan UK. doi:10.1057/9781137317247_7.

Rooth, Mats. 1985. *Association with focus*: University of Massachusetts, Amherst Ph.D. thesis.

Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* 1(1). 75–116. doi:10.1007/BF02342617.

Rooth, Mats. 1996. Focus. In Shalom Lappin (ed.), *The Handbook of Contemporary Semantic Theory*, 271–298. Oxford: Blackwell.

Rooth, Mats & Hongyuan Dong. 2011. A recursive phonology interface for WH-F alternative semantics. Poster presented at Semantics and Linguistic Theory 21.

Rooth, Mats & Barbara H. Partee. 1982. Conjunction, type ambiguity, and wide scope 'or'. In Daniel P. Flickinger, Marlys Macken & Nancy Wiegand (eds.), *Proceedings of the First West Coast Conference on Formal Linguistics*, 353–362. Stanford: Stanford Linguistics Association.

Shan, Chung-chieh. 2004. Binding alongside Hamblin alternatives calls for variable-free semantics. In Kazuha Watanabe & Robert B. Young (eds.), *Proceedings of Semantics and Linguistic Theory 14*, 289–304. Ithaca, NY: Cornell University. doi:10.3765/salt.v14i0.2901.

Shimoyama, Junko. 2006. Indeterminate phrase quantification in Japanese. *Natural Language Semantics* 14(2). 139–173. doi:10.1007/s11050-006-0001-5.

Szabolcsi, Anna. 2003. Binding on the fly: Cross-sentential anaphora in variable-free semantics. In Geert-Jan M. Kruijff & Richard T. Oehrle (eds.), *Resource-sensitivity, binding and anaphora*, chap. 8, 215–227. Dordrecht: Kluwer Academic Publishers. doi:10.1007/978-94-010-0037-6_8.

Zimmermann, Thomas Ede. 1991. Dynamic logic and case quantification. In Martin Stokhof, Jeroen Groenendijk & David Beaver (eds.), *Quantification and Anaphora I (DYANA Deliverable R2.2.A)*, 191–195.